CLAIMS

What is claimed is:

1. A photosensitive element for use as a flexographic printing plate comprising

a) a support,

b) at least one elastomeric photopolymerizable layer on the support containing at least one elastomeric binder, at least one ethylenically unsaturated compound photopolymerizable by actinic radiation, and at least one photoinitiator or photoinitiator system, the elastomeric photopolymerizable layer having a surface opposite the support that defines a plane; and

c) a matted layer disposed above the surface of the photopolymerizable layer comprising a polymeric binder and at least one matting agent, the at least one matting agent capable of forming depressions from the plane into the photopolymerizable layer, and selected from the group consisting of

i) matting agents having a pore volume of ≥ 0.9 ml/g;

ii) matting agents having a BET surface of ≥ 150 m^2/g;

iii) matting agents having an oil number of $\geq$ 150g/100g;

iv) matting agents having at least one crosslinkable group; and

v) combinations thereof.

2. The photosensitive element of Claim 1 wherein the matted layer has a surface opposite the photopolymerizable layer that is smooth or substantially smooth.

3. The photosensitive element of Claim 1 wherein the matting agent is capable of forming the depressions after contacting the matte layer to the photopolymerizable layer and during exposure to actinic radiation and treatment.

4. The photosensitive element of Claim 1 wherein the matting agent has a pore volume of 1.0-2.5 ml/g.

5. The photosensitive element of Claim 1 wherein the matting agent has a BET surface of ≥ 200 m^2/g.

6. The photosensitive element of Claim 1 wherein the matting agent has an oil number of ≥ 200 g/100 g.

7. The photosensitive element of Claim 1 wherein the matting agent is filled and/or loaded with at least one ethylenically unsaturated compound photopolymerizable by actinic radiation.

8. The photosensitive element of Claim 1 wherein the matting agent having at least one crosslinkable group contains at least one ethylenically unsaturated group photopolymerizable by actinic radiation.

9. The photosensitive element of Claim 1 wherein the matting agent is a matting agent with a mean particle size of ≥ 3 µm.

10. The photosensitive element of Claim 1 wherein the matting agent is a matting agent with a mean particle size of 3-25 µm.

11. The photosensitive element of Claim 1 wherein the matting agent is a matting agent with a mean particle size of ≥ 3 µm, a pore volume of ≥ 0.9 ml/g, and oil number of ≥ 150 g/100 g.

12. The photosensitive element of Claim 1 wherein the matting agent is a matting agent with a mean particle size of ≥ 3 µm, a pore volume of ≥ 0.9 ml/g, oil number of ≥ 150 g/100 g, and a BET surface of ≥ 150 m^2/g.

13. The photosensitive element of Claim 1 wherein the matting agent is a matting agent with a mean particle size of ≥ 3 µm, a pore volume of 1.0-2.5 ml/g, oil number of ≥ 200 g/100 g, and a BET surface of ≥ 200 m^2/g.

14. The photosensitive element of Claim 1 wherein the matting agent comprises ≤ 20 % by weight of particles with a particle size of ≥ 15 µm, the weight percentage based on the total amount of matting agent.

15. The photosensitive element of Claim 1 wherein the matting agent comprises ≥ 10 % by weight of a matting agent with a particle size of ≤ 3 µm, the weight percentage based on the total amount of matting agent.

16. The photosensitive element of Claim 1 wherein the matted layer comprises at least one matting agent selected from the group consisting of silicic acids, silicates, and/or aluminates.

17. The photosensitive element of Claim 1 wherein the matted layer comprises at least one polymeric binder selected from the group consisting of polyamides, polyvinyl alcohols, polyurethanes, urethane copolymers, polyvinyl pyrrolidones, polyethylene oxides, copolymers of ethylene and vinyl acetate, polyacrylates, polyesters, cellulose esters, cellulose ethers, and polyolefins.

18. The photosensitive element of Claim 1 wherein the matted layer comprises at least one pigment and/or dye.

19. The photosensitive element of Claim 1 wherein the matted layer further comprises an auxiliary agent selected from the group consisting of plasticizers, coating aids, viscosity modifying agents, wetting agents, surfactants, waxes, and dispersing agents.

20. The photosensitive element of Claim 1 wherein the matted layer further comprises at least one additive selected from the group consisting of an infrared-sensitive compound, a radiation opaque material, and wax.

21. The photosensitive element of Claim 1 further comprising an additional layer between the matted layer and the elastomeric photopolymerizable layer, the additional layer selected from the group consisting of an elastomeric layer capable of becoming photosensitive, a wax layer, and a laser-radiation-sensitive layer.

22. The photosensitive element of Claim 1 further comprising an additional layer disposed above the matted layer, the additional layer selected from the group consisting of a wax layer, and a laser-radiation-sensitive layer.

23. The photosensitive element of Claim 1 further comprising a cover sheet on the matted layer opposite the photopolymerizable layer.

24. The photosensitive element of Claim 1 further comprising an IR-sensitive layer disposed above the matted layer opposite the photopolymerizable layer.

25. A process for preparing a photosensitive element comprising

(a) providing an elastomeric photopolymerizable layer disposed on a support wherein the photopolymerizable layer contains at least one elastomeric binder, at least one ethylenically unsaturated compound photopolymerizable by actinic radiation, and at least one photoinitiator or photoinitiator system, the elastomeric photopolymerizable layer having a surface opposite the support that defines a plane;

(b) providing a matted layer comprising a polymeric binder and at least one matting agent, the at least one matting agent capable of forming depressions from the plane into the photopolymerizable layer, and selected from the group consisting of

i) matting agents having a pore volume of $\geq$ 0.9 ml/g;

ii) matting agents having a BET surface of ≥ 150 m^2/g ;
iii) matting agents having an oil number of ≥ 150g/100g;
iv) matting agents having at least one crosslinkable group; and
v) combinations thereof,

and

(c) contacting the matted layer with the surface of the elastomeric photopolymerizable layer forming the photosensitive element.

26. The process of Claim 25 wherein the photosensitive element further comprises an additional layer between the matted layer and the elastomeric photopolymerizable layer, the additional layer selected from the group consisting of an elastomeric layer capable of becoming photosensitive, and a wax layer, the process further comprising: providing the additional layer to the element by either (d') providing the additional layer on the surface of the elastomeric photopolymerizable layer, and contacting the matted layer to a surface of the additional layer opposite the elastomeric photopolymerizable layer, or (d") providing the additional layer on the matted layer and contacting the additional layer to the surface of the elastomeric photopolymerizable layer.

27. The process of Claim 25 wherein contacting is by laminating the matted layer on the surface of the photopolymerizable layer opposite the support.

28. The process of Claim 25 wherein contacting comprises:

(1) passing into the nip of a calender a mass of a hot photopolymerizable composition comprising at least one elastomeric polymer, at least one ethylenically unsaturated compound photopolymerizable by actinic radiation, and at least one photoinitiator or photoinitiator system, and

(2) while hot, calendering the photopolymerizable composition between the support and a cover element to form the photopolymerizable layer therebetween, wherein the cover element comprises a cover sheet and the matted layer, the matted layer being adjacent to the photopolymerizable layer.

29. A process for preparing a flexographic printing plate comprising

(A) exposing to actinic radiation through a photomask a photosensitive element comprising

a) a support,

b) at least one elastomeric photopolymerizable layer on the support containing at least one elastomeric binder, at least one ethylenically unsaturated compound photopolymerizable by actinic radiation, and at least one photoinitiator or photoinitiator system, the elastomeric photopolymerizable layer having a surface opposite the support that defines a plane, and

c) a matted layer disposed above the surface of the photopolymerizable layer comprising a polymeric binder and at least one matting agent, the at least one matting agent capable of forming depressions from the plane into the photopolymerizable layer, and selected from the group consisting of

i) matting agents having a pore volume of ≥ 0.9 ml/g

ii) matting agents having a BET surface of ≥ 150 m^2/g

iii) matting agents having an oil number of ≥ 150g/100g;

iv) matting agents having at least one crosslinkable group; and

v) combinations thereof,

forming polymerized areas and unpolymerized areas in the photopolymerizable layer;

(B) removing the photomask, and

(C) treating the exposed photosensitive element to remove unpolymerized areas and form a relief surface suitable for printing,

wherein the polymerized areas contain a plurality of depressions from the plane into the polymerized areas.

30. The process of Claim 29 wherein the plurality of depressions are located on a printing surface, and the depressions are characterized by surface pits such that at least 40% of printing surface is covered with surface pits.

31. The process of Claim 29 wherein the plurality of depressions are located on a printing surface, and the depressions are characterized by surface pits such that at least 50% of printing surface is covered with surface pits.

32. The process of Claim 29 wherein the plurality of depressions are located on a printing surface, and the printing surface is free or substantially free of surface peaks.

33. The process of Claim 29 wherein the depressions are at least 2 microns in depth.

34. The process of Claim 29 wherein the depressions are characterized by surface pits which are present at a surface pit density of at least 500 pits per square millimeter.

35. The process of Claim 29 wherein the plurality of depressions are located on a printing surface, and the depressions are characterized by surface pits ≥ 2 microns in depth which are present at a frequency of greater than about 80 surface pits per square millimeter on the printing surface.

36. The process of Claim 29 wherein the plurality of depressions are located on a printing surface, and the depressions are characterized by surface pits ≥3 microns in depth which are present at a frequency of greater than about 30 surface pits per square millimeter on the printing surface.

37. The process of Claim 29 wherein the plurality of depressions are located on a printing surface, and the depressions are characterized by surface pits ≥4 microns in depth which are present at a frequency of greater than about 10 surface pits per square millimeter on the printing surface.

38. The process of Claim 29 wherein the plurality of depressions are located on a printing surface, and the depressions are characterized by surface pits ≥5 microns in depth which are present at a frequency of greater than about 1 surface pits per square millimeter on the printing surface.

39. The process of Claim 29 wherein the plurality of depressions are located on a printing surface and have a depression aspect ratio between 10: 1 to 2:1.

40. The process of Claim 29 wherein the plurality of depressions are located on a printing surface and have a depression aspect ratio of at least 2:1.

41. The process of Claim 29 wherein the plurality of depressions are located on a printing surface and have a depression aspect ratio of less than 10:1.

42. The process of Claim 29 wherein the depressions are characterized by a surface pit opening size of at least 5 microns.

43. The process of Claim 29 wherein the plurality of depressions are located on a printing surface that has no or substantially no surface peaks above the plane of the photopolymerizable layer.

44. The process of Claim 29 wherein the treating step (C) is selected from the group consisting of

(1) developing with at least one washout solution selected from the group consisting of solvent solution, aqueous solution, semi-aqueous solution, and water; and

(2) heating the element to a temperature sufficient to cause the unpolymerized portions to melt, flow, or soften, and contacting the element with an absorbent material to remove the unpolymerized portions.

45. The process of Claim 29 wherein the exposing step (A) occurs in a vacuum.

46. The process of Claim 29 wherein the exposing step (A) occurs in the absence of atmospheric oxygen.

47. The process of Claim 29 wherein the exposing step (A) occurs in the presence of atmospheric oxygen.

48. The process of Claim 29 further comprising exposing the photosensitive element to ultraviolet radiation between 200 and 300 nm, prior to the treating step (C).

49. The process of Claim 29 wherein the photosensitive element comprises an integrated photomask and the exposing step (A) occurs in the presence of atmospheric oxygen, further comprising exposing the photosensitive element to ultraviolet radiation between 200 and 300 nm, prior to the treating step (C).

50. The process of Claim 29 wherein the removing step (B) occurs during the treating step (C).

51. The photosensitive element of Claim 3 wherein the exposure occurs in a vacuum.

52. The process of Claim 29 wherein the plurality of depressions are located on a printing surface, and the depressions are characterized by surface pits such that at least 30% of printing surface is covered with surface pits.

53. A flexographic printing plate produced by the process of Claim 29.

54. The process of Claim 29 wherein the plurality of depressions are located on a printing surface, and the depressions are characterized by surface pits such that at least 10% of printing surface is covered with surface pits.

55. The process of Claim 29 wherein the plurality of depressions are located on a printing surface, and the depressions are characterized by surface pits such that at least 60% of printing surface is covered with surface pits.

56. The process of Claim 29 wherein the plurality of depressions are located on a printing surface, and the depressions are characterized by surface pits such that 10 to 40% of printing surface is covered with surface pits.

57. The process of Claim 29 wherein the plurality of depressions are located on a printing surface, and the depressions are characterized by surface pits such that 30 to 60% of printing surface is covered with surface pits.

58. The process of Claim 29 wherein the depressions are characterized by surface pits which are present at a surface pit density of at least 350 pits per square millimeter.

59. The process of Claim 29 wherein the depressions are characterized by surface pits which are present at a surface pit density of 200 to 3000 pits per square millimeter.

60. The process of Claim 29 wherein the depressions are characterized by surface pits which are present at a surface pit density of 350 to 2500 pits per square millimeter.

61. The process of Claim 29 wherein the depressions are characterized by surface pits which are present at a surface pit density of 350 to 1000 pits per square millimeter.

62. The process of Claim 29 wherein the depressions are characterized by a surface pit opening size of 5 to 30 microns.

63. The process of Claim 29 wherein the depressions are characterized by a surface pit opening size of 8 to 22 microns.

64. The process of Claim 29 wherein the depressions are characterized by a surface pit opening size of 10 to 15 microns.

65. The process of Claim 29 wherein the matted layer has a surface opposite the photopolymerizable layer that is smooth or substantially smooth.

66. The photosensitive element of Claim 29 wherein the matted layer comprises at least one pigment and/or dye.

67. The process of Claim 29 wherein the matted layer further comprises an auxiliary agent selected from the group consisting of plasticizers, coating aids, viscosity modifying agents, wetting agents, surfactants, waxes, and dispersing agents.

68. The process of Claim 29 wherein the matted layer further comprises at least one additive selected from the group consisting of an infrared-sensitive compound, a radiation opaque material, and wax.

69. The process of Claim 29 further comprising an additional layer between the matted layer and the elastomeric photopolymerizable layer, the additional layer selected from the group consisting of an elastomeric layer capable of becoming photosensitive, a wax layer, and a laser-radiation-sensitive layer.

70. The process of Claim 29 further comprising an additional layer disposed above the matted layer, the additional layer selected from the group consisting of a wax layer, and a laser-radiation-sensitive layer.

71. The process of Claim 29 further comprising an IR-sensitive layer disposed above the matted layer opposite the photopolymerizable layer.

72. The process of Claim 29 wherein the photopolymerizable layer further comprises a second photoinitiator sensitive to actinic radiation between 200 and 300 nm.

73. The process of Claim 72 wherein the second photoinitiator is sensitive to radiation between 245 and 265 nm.

74. The process of Claim 48 wherein the photopolymerizable layer further comprises a second photoinitiator sensitive to actinic radiation between 200 and 300 nm.